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Vol. 93 NOVEMBER 9, 1940 No. 10

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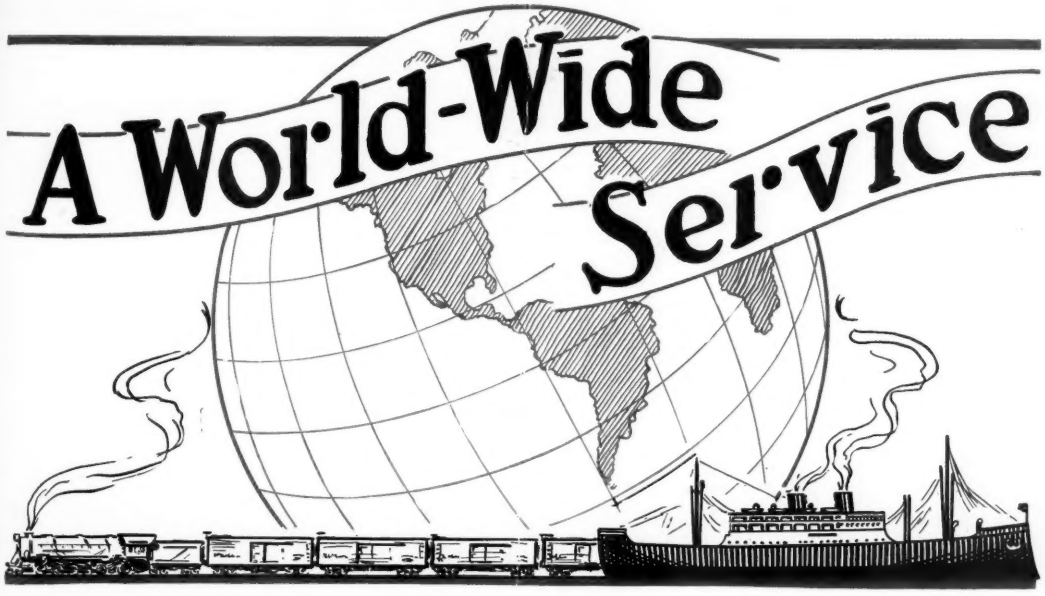

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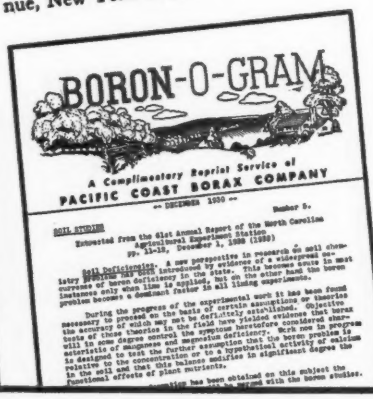
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The Atlanta Convention

National Fertilizer Association to Hold Southern Meeting on November 18th, 19th and 20th. Large Attendance Expected as Defense Program Creates Added Interest.

THE Sixteenth Annual Southern Convention of the National Fertilizer Association will be held this year in Atlanta on November 18th, 19th and 20th. The sessions will be held at the Atlanta-Biltmore Hotel. In past years the attendance has run well over the 400 mark; this year, because of the added problems of the industry due to the National defense program, it is expected that previous attendance records will be broken.

The officers of the Association have arranged a very timely program with ample opportunity for full discussion of a number of current fertilizer problems. Monday, November 18th will be given over to committee sessions, the Board of Directors meeting at 10 A. M., and the Soil Improvement Committee at 3 P. M. The general Sessions will be held on Tuesday, November 19th and Wednesday, November 20th, with President John E. Sanford in the chair. The Tuesday meeting will consider such topics as public relations, government expansion in fertilizer production and distribution, and the relation of the industry to national preparedness. The Wednesday session will deal with soil improvement work and in addition to general discussion there will be addresses by prominent agronomists on this important phase of the industry.

The Annual Industry Dinner will be held on Tuesday evening, November 19th at 7.30. The principal speaker will be Hon. James A. Emery, general counsel of the National Association of Manufacturers. There will also be a showing of the new N. F. A. colored film "Putting Plant Food to Work."

The detailed program is as follows:

MONDAY, NOVEMBER 18TH

10.00 A. M. Board of Directors.

3.00 P. M. Soil Improvement Committee.

TUESDAY, NOVEMBER 19TH

General Session, 10.30 A. M.

President, John E. Sanford in the chair.

Invocation: Rev. Ryland Knight, Second Ponce de Leon Baptist Church, Atlanta, Ga.

Opening Address: John E. Sanford, President, The National Fertilizer Association.

Public Relations Discussion

Opening Statement: A. Lynn Ivey, President, Virginia-Carolina Chemical Corp., Richmond, Va., and Chairman, Public Relations Committee, The National Fertilizer Association.

Facts — Our Industry's Best Protection: Maurice H. Lockwood, Eastern States Farmers' Exchange, Springfield, Mass.

Public Relations Program of a Related Industry: Leon H. Davies, The Southern Cotton Oil Co., New Orleans, La.

Superphosphate Distribution by the Agricultural Adjustment Administration: J. A. Miller, President, Price Chemical Co., Louisville, Ky., and Vice-President, The National Fertilizer Association.

Government Expansion in Fertilizer Production: J. W. Dean, Treasurer, Knoxville Fertilizer Co., Knoxville, Tenn.

General Discussion: The Fertilizer Industry and National Preparedness.

New Business.

Annual Industry Dinner, 7.30 P.M.

President, John E. Sanford presiding.

Introduction of Guests.

Address: "This Changing World." Hon. James A. Emery, General Counsel, National Association of Manufacturers, Washington, D. C.

New Colored Moving Picture: "Putting Plant Food to Work." Produced by the Association.

WEDNESDAY, NOVEMBER 20TH

General Session, 10.00 A.M.

President, John E. Sanford in the chair.

Soil Improvement Discussion

Opening Statement: H. S. Parsons, Vice-President, Naco Fertilizer Co., New York, N. Y., and Chairman, Soil Improvement Committee, The National Fertilizer Association.

Cooperation with Agricultural Colleges and Experiment Stations: W. S. Rupp, Vice-President, The Baugh & Sons Co., Baltimore, Md.

Educational Problems in Specialized Crop Areas: (Speaker to be announced.)

Industry Cooperation in Agronomic Work: (Speaker to be announced.)

"Helping to Solve Southern Agricultural Problems": Dr. Frank W. Parker, Agronomist, E. I. duPont de Nemours & Co., Wilmington, Del.

October Tag Sales

Fertilizer sales in 17 States in October as indicated by the sale of tax tags amounted to 206,500 tons, according to reports to The National Fertilizer Association. Although this tonnage was slightly below last year it was considerably larger than two years ago. October sales are relatively small, accounting for only about 3 per cent of the annual total.

Total sales in the first ten months of the year were somewhat larger than in the corresponding period of 1939, the result of a slight rise in the South and a more substantial upturn in the Midwest. Seven of the southern States and all five of the midwestern States have reported larger sales this year than last.

The gain in the South has occurred in spite of the 143,000-ton decline in North Carolina and smaller decreases in Virginia, Louisiana, and Oklahoma. Tonnage in South Carolina has been about the same as last year. Excluding Virginia and North Carolina, where the reduction in tobacco acreage has had an adverse effect on tonnage, sales in the South have been 6 per cent above last year.

It now seems likely that sales of fertilizer for cotton and tobacco in 1941 will be about the same as in 1940. There should be an increase in fertilizer used for fruits, vegetables, and pastures. The U. S. Department of Agriculture forecast indicates a higher farm income for 1941 than the 9 billion dollars received in 1940.

FERTILIZER TAX TAG SALES

State	October				January-October			
	1940		1939	1938	1940		1939	1938
	Per Cent of 1939	Tons	Tons	Tons	Per Cent of 1939	Tons	Tons	Tons
Virginia	128	28,841	22,457	25,870	94	381,228	406,347	396,142
N. Carolina	78	22,267	28,637	19,606	88	1,018,712	1,162,031	1,042,585
S. Carolina	111	13,169	11,890	6,150	100	656,653	656,934	640,120
Georgia	909	10,004	1,100	4,675	108	728,123	672,612	705,944
Florida	101	65,784	64,936	47,539	109	448,148	410,421	392,880
Alabama	293	4,250	1,450	750	104	570,550	550,600	525,700
Mississippi	47	10,393	22,125	250	102	304,688	299,971	300,086
Tennessee	130	16,347	12,545	6,087	112	146,238	130,344	127,338
Arkansas	78	5,000	6,400	1,500	137	98,950	72,022	65,000
Louisiana	44	7,544	17,100	6,790	97	149,975	154,288	139,292
Texas	481	5,145	1,070	2,263	129	114,984	89,407	80,061
Oklahoma	15	55	355	0	95	6,663	7,022	7,855
Total South	99	188,799	190,065	121,480	100	4,624,912	4,611,999	4,423,003
Indiana	55	3,031	5,500	1,313	115	302,381	262,458	234,928
Illinois	82	3,313	4,032	2,863	120	51,073	42,669	41,655
Kentucky	113	7,706	6,813	3,288	104	122,590	118,042	109,644
Missouri	83	2,895	3,475	2,093	130	87,494	67,556	70,044
Kansas	359	825	230	162	122	17,496	14,296	18,079
Total Midwest	89	17,770	20,050	9,719	115	581,034	505,021	474,350
Grand Total	98	206,569	210,115	131,199	102	5,205,946	5,117,020	4,897,353

Free Acids in Superphosphate and a Rapid Method for Making the Determination*

By PHILIP McG. SHUEY
Savannah, Ga.

A STUDY of the mass of important literature on the subject by Ross, Beeson, Hill and Jacob, coupled with the results of practical experiments that have been conducted under factory conditions, goes to show that the problem of making the determination and interpreting results is at times rather complex, especially when analyzing green or fresh-made superphosphate which is still undergoing rapid chemical change. Besides the changes which take place in the superphosphate in the pile, additional changes at times occur during the process of making the analysis. The various factors involved in these changes have been ably explained in the various articles published in the A. O. A. C. Journals cited at the end of this paper.

While various causes may have an effect on the determination of the free acids, yet the estimation has much practical value, especially as it has long been established that very well cured superphosphate will contain only from 2½ to 3% of residual free acids expressed as P_2O_5, which is equivalent to from 3.45 to 4.14% of H_3PO_4. This residual free acid in the cured product corresponds with from about 0.30 to 0.50% of citrate insoluble phosphoric acid according to good fertilizer practice.

Since during the curing process the free acids and the citrate-insoluble phosphoric acid decrease proportionately and bear a rather definite relation with each other, it may be readily calculated from the analysis of rather freshly made superphosphate what analysis may be expected after curing and whether or not the sulphuric acid and ground phosphate rock have been mixed in the proper proportion when the relation has been established. The calculation may be very easily made by subtracting the anticipated residual free acids after curing from the free acids found, and multiplying the difference by the value in terms of 1% of convertibility. Then the extent of increase in available phosphoric acid subtracted from the citrate-insoluble found will show the amount of citrate-insoluble that may be expected after curing. If the calculation should show no citrate-insoluble remaining, the superphosphate has been over-acidulated. If, on the other hand, the citrate-insoluble should be found too high, it has been under-acidulated.

With a knowledge of the rate of curing and the amount of residual free acids that may be expected over any given period, the amount of available P_2O_5 may likewise be calculated for any curing period such as a month, six weeks or two months, and when the curing period is shortened, it may be advisable to have present a larger amount of free acids at the beginning in order to hasten the curing process.

A rapid method for making the determination has been devised which consists of placing two grams of superphosphate in a small mortar provided with a lip, adding thereto approximately 5 cc. of acetone (neutral, 0.788 to 0.790 specific gravity at 25° C.), grinding so as to reduce the size of the particles and bring them in intimate contact with the extractant, but not grind to such a fine state of division as to cause difficulty in filtering later. Transfer to a 100 cc. volumetric flask, wash out the mortar quickly and thoroughly with the acetone, fill to mark and stopper the flask and shake vigorously for one minute. Filter rapidly, keeping the funnel rather full, and in warm weather keep the funnel covered with a watch glass, and allow solution to pass into a small flask having a small opening. Take a 50 cc. aliquot (equivalent to 1 gram of sample), dilute with approximately 150 cc. of distilled water, add a few drops of alizarine and titrate with 0.1*N* NaOH. The number of cc. required multiplied by 0.9804 equals the per cent of total free acids expressed as H_3PO_4.

If it is desired to obtain the percentage of extracted volatile fluorine acids equivalent to H_3PO_4, 50 cc. of the acetone extract, obtained as above, is pipetted into a 250-300 cc. Soxlet or Erlenmeyer flask, placed on the water bath and allowed to evaporate and volatilize for about 6 hours, after which water is added and the phosphoric acid titrated. The difference between the titration of the total free acids and the phosphoric acid gives the volatile fluorine acids equivalent to phosphoric acid, which will usually be found to amount to about 0.20%.

* A paper presented at the meeting of the Division of Fertilizer Chemistry, American Chemical Society, Detroit, Mich., September 10, 1940.

The method of grinding the weighed sample with the extractant has the advantage of saving time without apparently sacrificing accuracy. It is especially adapted for samples that are too wet to prepare properly. It has the further advantage of lessening the period of contact between free H_3PO_4 and dicalcium phosphate, which might result in the formation of some monocalcium phosphate which would yield low results.

Experiments were conducted to show the effect of adding dicalcium phosphate in the form of precipitated bone to superphosphate. When making the additions to a two-gram charge taken for analysis, the following results were obtained when carrying out the acetone extraction for different periods of time:

The original sample with no added dicalcium phosphate showed 6.27% free H_3PO_4 by the rapid method outlined above and 6.17% free H_3PO_4 after extracting for 12 hours. The addition of 0.1 gram of precipitated bone showed 5.88% free H_3PO_4 and 5.64% free H_3PO_4 respectively, and the addition of 0.5 gram of precipitated bone showed 5.88% by the rapid method and only 3.92% after extracting for 12 hours, which represents a loss of 2.55% on account of the reaction between the free acid and the dicalcium phosphate.

It might be stated that an examination of the precipitated bone showed it to be neutral and both this and solid monocalcium phosphate were found to be absolutely insoluble in acetone.

Results by the quick method have been compared with those obtained by the use of the acetone method employed in the collaborative work of the A. O. A. C. on five samples, and all were found to yield practically identical results.

The use of absolute alcohol and 95% alcohol were also found to afford results in good agree-

Table No. I

Factory Experiments Conducted by P. McG. Shuey Showing Changes in Superphosphate at Different Intervals

	Fresh Made After Few Hours %	After 3 Days %	After 1 Week %	After 3 Weeks %	After 4 Weeks %
Total free acids equivalent H_3PO_4 by acetone extraction method					
Plant #1	9.08	7.88	7.27	5.73	....
Plant #2	7.90	6.96	6.22	4.11	4.02
Plant #3	7.74	6.42	5.59	5.09	4.11
Plant #3 25-lb. sample kept in box in laboratory	7.20	5.04	4.46	4.44	3.97
Free acids as P_2O_5 by acetone extraction method					
Plant #1	6.58	5.71	5.27	4.15	....
Plant #2	5.73	5.04	4.51	2.98	2.91
Plant #3	5.61	6.30	4.05	3.69	2.98
Plant #3 25-lb. sample, etc.	5.22	3.65	3.23	3.22	3.51
Total free acids equivalent H_2SO_4 by acetone extraction method					
Plant #1	4.54	3.94	3.63	2.86	....
Plant #2	3.95	3.48	3.11	2.05	2.01
Plant #3	3.87	3.21	2.79	2.54	2.05
Plant #3 25-lb. sample, etc.	3.60	2.52	2.23	2.22	1.98
Free acids equivalent H_3PO_4 after evaporation of extractant					
Plant #1	8.91	7.59	7.15	5.49	....
Plant #2	7.83	6.52	5.88	3.86	3.82
Plant #3	7.64	6.10	5.38	4.80	4.02
Plant #3 25-lb. sample, etc.	7.11	4.75	4.22	4.11	4.42**
Fluorine acids equivalent to H_3PO_4					
Plant #1	....	0.29	0.12	0.24	....
Plant #2	....	0.44	0.34	0.25	0.20
Plant #3	....	0.32	0.21	0.29	0.09
Plant #3 25-lb. sample, etc.	....	0.29	0.24	0.33	....
Total free acids equivalent H_3PO_4 by titration of water solution using methyl orange method					
Plant #1	8.96	7.91	7.07	5.78	....
Plant #2	7.94	7.22	6.90	4.20	4.13
Plant #3	8.32	6.42	5.95	5.15	3.97
Plant #3 25-lb. sample, etc.	7.13	5.52	4.51	3.64	3.97

Table I (Continued)

	Fresh Made After Few Hours %	After 3 Days %	After 1 Week %	After 3 Weeks %	After 4 Weeks %
Free P_2O_5 by titration of water solution using methyl orange method					
Plant #1	6.49	5.73	5.12	4.19	....
Plant #2	5.75	5.23	5.00	3.04	2.99
Plant #3	6.03	4.65	4.31	3.73	2.88
Plant #3 25-lb. sample, etc.	5.17	4.00	3.27	2.64	2.88
Total free acids equivalent H_2SO_4 by titration of water solution using methyl orange method					
Plant #1	4.48	3.95	3.53	2.89	....
Plant #2	3.97	3.61	3.45	2.10	2.06
Plant #3	4.16	3.21	2.97	2.57	1.98
Plant #3 25-lb. sample, etc.	3.56	2.76	2.25	1.82	1.98
Conversion of the insoluble P_2O_5 to available by 1% free H_3PO_4 from beginning based on acetone extraction method					
Plant #1		1.02	0.85	0.52	....
Plant #2		1.10	0.80	0.37	0.38
Plant #3		0.44	0.35	0.52	0.40
Plant #3 25-lb. sample, etc.		0.32	0.24	0.30	0.31
Conversion of the insoluble P_2O_5 to available by 1% free P_2O_5 from beginning based on acetone extraction method					
Plant #1		1.40	1.18	0.72	....
Plant #2		1.51	1.10	0.50	0.52
Plant #3		0.60	0.48	0.71	0.55
Plant #3 25-lb. sample, etc.		0.44	0.34	0.41	0.43
Conversion of the insoluble P_2O_5 to available by 1% free H_2SO_4 from beginning based on acetone extraction method					
Plant #1		2.03	1.70	1.04	....
Plant #2		2.21	1.60	0.74	0.76
Plant #3		0.88	0.70	1.04	0.80
Plant #3 25-lb. sample, etc.		0.64	0.48	0.60	0.62
Citrate insoluble P_2O_5					
Plant #1	2.53	1.31	0.79	0.78	....
Plant #2	2.78	1.74	1.47	1.39	1.30
Plant #3	2.65	2.07	1.80	1.28	1.20
Plant #3 25-lb. sample, etc.	2.26	1.57	1.59	1.43	1.26
Total phosphoric acid (P_2O_5)					
Plant #1	20.14	19.50	19.52	19.78	....
Plant #2	19.28	18.80	18.93	19.20	19.26
Plant #3	19.35	19.15	19.63	19.25	19.28
Plant #3 25-lb. sample, etc.	19.26	19.29	19.80	17.47	17.30
Available phosphoric acid (P_2O_5)					
Plant #1	17.61	18.19	18.73	19.00	....
Plant #2	16.50	17.06	17.46	17.81	17.96
Plant #3	16.70	17.08	17.83	17.97	18.08
Plant #3 25-lb. sample, etc.	17.00	17.72	18.21	16.04	16.04
Water soluble phosphoric acid (P_2O_5)					
Plant #1			18.08		
Plant #2			16.76		
Plant #3			16.59		
Plant #3 25-lb. sample, etc.			17.00		
Moisture					
Plant #1	9.30	9.66	8.67	9.22	....
Plant #2	9.70	10.08	10.12	9.72	9.28
Plant #3	8.02	10.02	9.16	10.62	9.00
Plant #3 25-lb. sample, etc.	9.84	7.02	7.82	17.44	16.74

** Omitted from conclusions in writing paper.

ment with the acetone method, but acetone is to be preferred as it may be easily obtained absolutely neutral.

Results showing the analyses of samples taken from three large factories at different intervals are furnished to show the changes in superphosphate (Table I). The 25 pound laboratory sample mentioned was damaged by a storm after the third period.

The results show the free acids expressed in various forms obtained by the above outlined method, also by the water extraction method of washing 1 gram on a 11 cm. filter paper to a volume of approximately 250 cc. and titrating to the final end-point, using methyl orange, which is a convenient method in factory control practice as the first washing in making the citrate-insoluble phosphoric acid determination may be used.

The percentages of fluorine acids equivalent to phosphoric acid are also given in the table, and the ordinary determinations are likewise furnished.

The free acids are calculated to H_3PO_4, P_2O_5, and H_2SO_4, and the ratios for 1% of each of the various free acids are given with respect to the additional available P_2O_5 produced. It may be mentioned here that the ratios found in the early stages of curing are not the same for superphosphate of all makes. The equivalents in H_2SO_4 are shown, owing to the fact that most of the large companies are accustomed to taking this acid as a basis, and most of them consider that 1% of free H_2SO_4 will render 0.5% citrate insoluble P_2O_5 available, which is in fairly good agreement with the reaction furnished by Dr. W. L. Hill as follows:

$$Ca_{10}(PO_4)_6(OH)_2 + 14H_3PO_4 = 10Ca(H_2PO_4)_2 + 2H_2O$$

On the basis of this equation, the following are the equivalent values:

1% free P_2O_5 equals 0.43% available P_2O_5
1% free H_3PO_4 equals 0.31% available P_2O_5
1% free H_2SO_4 equals 0.62% available P_2O_5

While the above equation does not take into account further reactions with compounds of fluorine, iron, aluminum, etc., it nevertheless is in agreement with the reaction found in actual practice during the curing process of superphosphate from the first week or ten days after it is manufactured. The reason why theory and practice so closely agree is doubtless due to the fact that most of the secondary reactions with impurities take place quickly during and immediately following the mixing process. The reason why the analysis of the freshly made material during the first week does not always work out according to theory is probably due to one or more of the following causes, all of which tend to give low results on free acids or a greater evaluation than theory would indicate.

1. Some fluorine acids are separated by acetone.

2. Some action between free H_3PO_4 and $Ca_2H_2(PO_4)_2$ may take place during the extraction process.

3. The presence of basic substances other than calcium phosphate.

4. The partial solubility of residual phosphate rock in neutral ammonium citrate.

It is interesting to note that all of the substances mentioned that may affect results are present in greater quantity in freshly made superphosphate than the cured material, and for this reason the amount of free acids found in very fresh material may at times be misleading.

By referring to the table, it will be seen that the results obtained on the freshly made superphosphate from Plant Number 3 show a more uniform ratio throughout between the free acids and the available phosphoric acid than the other experiments. It is regretted that these experiments were not conducted over a longer period, which would doubtless have shown increasing uniformity of the ratio between the drop in free acids and increase in available.

Back in 1924 the author presented a paper[1] on the subject at the Ithaca meeting in which an acetone method was given. The writer was not the author of the method and does not know its source. It was only reproduced. This method depends upon the titration of the first hydrogen of H_3PO_4 by the use of methyl red indicator and the second hydrogen by the use of phenolphthalein, and that any foreign acids will show up by an increase in the second titration over the first.

It has been claimed by some that an increase of the second titration over the first does not show the amount of fluorine acid in the extract equivalent to H_3PO_4 because fluorine acids also have the tendency to show a double titration in the same manner as phosphoric acid. Experiments have been conducted by the use of methyl red in titrating HF and H_2SiF_6 in aqueous solutions and in water-acetone solutions containing 50 cc. of acetone as compared with methyl orange in aqueous solutions, and these experiments show that, while methyl orange shows reactions similarly to H_3PO_4,

[1] "Free Acid in Acid Phosphate—Its Determination and Value" by P. McG. Shuey, Industrial and Engineering Chemistry, Vol. 17, No. 3, Page 269, March, 1925.

(Continued on page 22)

Exports and Imports of Fertilizer Materials

Exports of fertilizers and fertilizer materials from the United States in September amounted to 144,348 long tons with a stated valuation of $2,501,489. Total tonnage was moderately larger than in the corresponding month of recent years, with the increase due largely to larger exports of ammonium sulphate. Phosphate rock exports were also larger; declines took place in exports of other nitrogenous materials and potash.

Total exports in January-September were about 250,000 tons less this year than last, but ammonium sulphate exports were nearly 100,000 tons larger. Of the 122,000 tons of sulphate exported in the first nine months of this year 36,800 tons went to Japan, 22,600 tons to the Philippines, and 17,500 tons to the Netherlands Indies. In January-September, 1939, we had a net import balance of 60,000 tons of ammonium sulphate while this year we had a net export balance of 83,000 tons. There was thus a net shift of 160,000 *short* tons in our trade position. Domestic production was only 126,000 tons larger in January-September than in the first 9 months of 1939. This would indicate a net decline in supplies of 34,000 tons, which would help to explain the present tight supply.

Fertilizer imports in September were comparatively small, amounting to 68,128 long tons, valued at $1,424,649. Larger imports of sodium nitrate were much more than offset in the nitrogen group by declines in other materials. Potash imports were at a low level, consisting of 8,000 tons of muriate brought in from Spain. January-September imports were above last year, reflecting increased tonnages of sodium nitrate.

"THE WAR AND FERTILIZERS"

Remembering what happened to fertilizer prices in the last war, there is a natural question in the minds of farmers today as to what effect the present war will have. To present the favorable current position of fertilizer prices, the National Fertilizer Association has prepared a leaflet entitled "The War and Fertilizers" which is being distributed through purchase in quantities by the members of the Association. The leaflet presents facts about the current supply of materials and the current trend of prices which will allay any fears the farmers might have about sharp price increases or material shortages.

TVA TO BUILD NEW PHOSPHATE PLANT

The Tennessee Valley Authority announced on November 5th that it will immediately begin construction of a million-dollar plant for the treatment of raw phosphatic materials mined from its own deposits. The plant will be located at Godwin Station on the L. & N. Railroad, about three miles north of Columbia, Tenn.

The operations will provide for the washing and drying of phosphate rock and for the sintering of a portion of the output. The materials thus treated will be shipped to the electric furnaces at Muscle Shoals to be made into fertilizers. Many of the processes to be used are a departure from customary procedure and plans call for continued studies in improvement of washing and preparing phosphate materials.

The plant, which will be completed in about 10 months, will have a capacity of 16,000 tons monthly and will employ about 100 men, many of them skilled workers.

Exports and Imports of Fertilizers and Fertilizer Materials—Long Tons

EXPORTS	September		January-September	
	1940	1939	1940	1939
Nitrogenous materials	29,729	27,157	207,901	125,640
Phosphate rock	82,336	58,113	485,208	814,634
Other phosphate materials	18,377	18,791	111,485	81,675
Potash salts	12,552	17,214	49,444	96,596
Other fertilizers	1,354	2,517	26,019	13,547
Grand Total	144,348	123,792	880,057	1,132,092

IMPORTS	September		January-September	
	1940	1939	1940	1939
Sodium nitrate	37,610	10,445	573,403	436,261
Other nitrogenous materials	14,387	55,371	241,475	367,456
Phosphate materials	6,913	5,181	65,040	73,491
Potash salts	7,787	15,877	231,534	173,872
Other fertilizers	1,431	560	35,452	43,295
Grand Total	68,128	87,434	1,146,904	1,094,375

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Selective Service Act to Safeguard Production

Sounding a note of caution to employers and workers alike not to become "unduly anxious" about occupational deferment of employes from training under the Selective Service Act, C. A. Dykstra, Director of Selective Service, assured them on October 28th that "for the greatest interest of the nation" production of necessary materials will be given preference over manpower requirements as its armed forces are increased.

Mr. Dykstra said, "Don't be anxious or hasty regarding occupational deferments. Be patient. Full information will be available for all concerned in ample time. The Act, the Regulations and the whole Selective Service System provide all necessary provisions and procedures to safeguard the interests of workers, of employers, the local community, the families of registrants and the interests of the Nation as a whole."

Mr. Dykstra emphasized that occupational deferments, each of which will be determined on an individual basis, rest with the local boards having jurisdiction of the 17,000,000 Selective Service registrants and not with National Headquarters of the Selective Service System. While National Headquarters is vitally interested in keeping key men in essential jobs, Mr. Dykstra pointed out that it cannot under any circumstances, interfere with a local board's inalienable right to decide whether its individual registrants should be deferred because of civilian occupations.

Employers should not worry about the occupational status of married employes. Mr. Dykstra stated their dependency status will be determined before any consideration is given to occupational deferment. If they are placed in Class III (deferred because of dependents), their occupational status will not be considered by the Local Board.

He suggested that all requests for occupational deferments of registrants employed in key jobs be postponed until such registrants have received questionnaires from the local boards. Each employer will have five days after the questionnaire is mailed in which to file a deferment request. The Director estimated that no questionnaires will be sent to registrants until November 7th. Questionnaires will be sent to the registrants in the order in which their numbers were drawn in the national lottery in Washington on October 29th. In no case will a deferment request be considered until the registrant's questionnaire has been completed and returned to the local board.

Because local boards are given the responsibility of deciding which men should be deferred from training because of their civilian jobs, State Advisors on Occupational Deferments have been appointed for all States and are now located in the respective State Headquarters of the Selective Service System.

Each State Advisor will act as a clearing house for all information pertaining to the economic situation within his State with particular regard to the need of industry, agriculture, or business, and other activities, for the deferment of certain individuals engaged therein. These State Advisors will maintain constant contact with local representatives from labor, industry, and agriculture.

Thus, each Local Board and Appeal Board will have promptly available to it accurate and complete information regarding the existing condition of labor supply and demand of business, agriculture, manufacturing, mining, transportation, and other industry in each section.

State Advisors will gladly assist employers in working out their problems with respect to deferment of essential employes, Mr. Dykstra said. State Advisors are already contacting labor organization, employers' associations, and agricultural groups, preparing the way for such cooperation with all those engaged in essential activities in each community.

Mr. Dykstra suggested that each employer list all registrants in his employ who do not have dependents and determine which cannot be immediately replaced if called for training. For these employes the employer should prepare accurate and concise information on the questions in Series IV on the registrant's questionnaire and a brief but complete explanatory statement of such employe's work, skill and the estimated time required to make a replacement.

This information should be included in the employer's request for occupational deferment for each such registrant on the Claim for Deferred Classification if and when such registrant receives a questionnaire.

Employers desirous of obtaining information concerning deferments may obtain copies of Volume III, Selective Service Regulations, pertaining to classification from the Superintendent of Documents, Washington, D. C., Mr. Dykstra said and added that they may consult local boards after the National Lottery.

Mr. Dykstra said: "It is a basis principle of Selective Service at this stage of the national defense preparation that material procurement is paramount. Therefore, where two requirements—military manpower *vs.* production—conflict, production should have priority."

FERTILIZER INVESTIGATION ABOUT COMPLETED

According to an article in the Winston-Salem (N. C.) Journal, it is reported that the fertilizer investigation will be completed by the middle of December. This investigation by a Federal Grand Jury, aided by Department of Justice Attorneys, has been going on since February 12th. At the conclusion of the sessions, the results will be announced and, if any indictments are to be made, they will be announced at that time.

NEW JERSEY FERTILIZER CONFERENCE

Practically 100 persons attended the conference which was held at the New Jersey Experiment Station at New Brunswick on October 24th. About 30 representatives of the Experiment Station and Extension Service, and representatives of 23 fertilizer companies selling in the State attended. Dr. William H. Martin, Dean and Director of the College of Agriculture and the Experiment Station, presided, and six of the talks were given by members of the College staff. In addition, there were talks by Dr. J. B. Hester of Campbell Soup Co., by W. S. Rupp of the Baugh & Sons Company, and by Charles J. Brand of the National Fertilizer Association. Grades to be recommended in New Jersey for 1941 will be the same as those recommended in 1940, with the exception that the 4-12-8 grade will be eliminated. This leaves nine grades, namely, 5-10-5, 5-10-10, 7-7-7, 4-12-4, 4-16-4, 3-12-6, 3-12-15, 0-14-7, and 0-12-12. All reference to other than these grades will be eliminated from the revised pamphlet which will be published in December and which will be offered to fertilizer manufacturers at cost.

JAPAN INCREASES SULPHATE IMPORTS

A sharp upward trend occurred in Japanese imports of ammonium sulphate in the first half of 1940, the total being reported at 82,963 metric tons, compared with 50,940 in early 1939. The chief supplier in 1940 was the United States, but in earlier years Japan obtained its ammonium sulphate supplies principally from European sources. Japan has imported substantial quantities of Chilean sodium nitrate during 1940, but the volume of the transactions is no longer separately recorded in the published official trade returns.

DELIVERIES OF POTASH SALTS

The American Potash Institute, Inc., announces that deliveries of agricultural potash by its member companies within the continental United States, Canada, Cuba, Puerto Rico, and Hawaii during the third quarter of the calendar year, 1940, amounted to 118,369 tons of actual K_2O, equivalent to 199,917 tons of potash salts. Constituting this total were 182,983 tons of muriate, 3,411 tons of manure salts, and 13,523 tons of sulphate. In addition, deliveries for chemical uses amounted to 16,216 tons of salts equivalent to 10,054 tons of K_2O. These figures include salts of domestic origin only. Based on import records of the Bureau of Foreign and Domestic Commerce potash imports in the form of chloride and sulphate salts during the third quarter amounted to approximately 11,550 short tons K_2O.

In terms of regional consignments, the total of 99,765 tons K_2O delivered within the continental United States was shipped as follows: Northeastern and Mid-Atlantic States, 25,554 tons; Southern States (including Virginia), 54,480 tons; Midwestern States, 18,178 tons; and West Coast States, 1,553 tons. The balance of 18,604 tons K_2O was delivered to Canada, Cuba, Puerto Rico and Hawaii.

For the first nine months of 1940 deliveries of agricultural K_2O amounted to 220,415 tons, equivalent to 375 820 tons of potash salts, consisting of 345,006 tons muriate; 7,535 tons manure salts; and 23,279 tons sulphate. For the first nine months of 1939, the figures for agricultural potash showed total deliveries of 158,846 tons of K_2O, equivalent to 293,631 tons of potash salts. These consisted of 230,902 tons of muriate, 4,876 tons of manure salts, 31,562 tons of sulphate, 13,849 tons of kainit, and 12,442 tons of sulphate of potash magnesia.

Regional distribution for 1940 on a K_2O basis was as follows: Northeastern and Mid-Atlantic States, 44,059 tons; Southern States (Virginia included), 97,145 tons; Midwestern States, 40,947 tons; West Coast States, 4,551 tons; the remainder, 33,713 tons K_2O was delivered to Canada, Cuba, Puerto Rico and Hawaii. In addition, deliveries for chemical uses amounted to 45,229 tons of salts equivalent to 28,042 tons of K_2O, compared with 16,877 tons in the same period of 1939. Imports of chloride and sulphate salts during the first nine months amounted to approximately 100,469 short tons of K_2O.

NEW BROKERAGE HOUSE OPENED

The firm of Tuteur & Co., Inc., has been established with offices at 60 Wall St., New York, to deal in fertilizers, packing house by-products and chemicals. The organizers, Roger Tuteur and L. Osterweil, were formerly engaged in this line in Brussels, Belgium, but managed to escape from the German invasion. The department for fertilizers and packing house by-products will be in charge of Roger Moran, who has had many years experience in this branch of the industry.

SUPERPHOSPHATE PRODUCTION INCREASING

While superphosphate production during September totaled 278,103 tons, compared with 273,378 tons in September, 1939, according to figures compiled by the National Fertilizer Association, the accumulated production for the first nine months of 1940 showed an increase of 23 per cent over the figures for the same period of 1940. The January-September totals were as follows: production, 2,724,472 tons in 1940 and 2,209,008 tons in 1939; shipments, 3,407,595 tons in 1940, and 3,105,550 tons in 1939; stocks on hand September 30th, 1,275,841 tons in 1940, and 1,151,976 tons in 1939.

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FERTILIZER MATERIALS MARKET

NEW YORK

Election Activities Blanket Interest in Materials. Organics Firm with Some Advances. Sulphate of Ammonia Still Scarce.

Exclusive Correspondence to "The American Fertilizer."

NEW YORK, November 4, 1940.

With interest more or less confined to election results, it is not surprising to note no increased activity at this time in the fertilizer materials market.

Organic fertilizers continue to be firm and, in spite of small buying interest, some advances have been made, notably by domestic blood and menhaden fishmeal. Chemical materials continue to be in a strong position and are moving in a normal manner with all prices maintained at previous levels.

Nitrate of Soda

$29.40 per ton in 100-lb. bags, $28.70 in 200-lb. bags, and $27.00 in bulk, f.o.b. port warehouse.

Sulphate of Ammonia

Domestic price unchanged with continuing tight market. Production figures recently released show an average this year of 58,000 tons per month, which is the highest average production we have had in this country for many years. Some small stocks have been accumulated and are being held at from $32.00 to $36.00, f.o.b. New York, for domestic consumption, and $38.50 for export. The export demand is still heavy, but not much new business has been done.

Superphosphate

Ordinary superphosphate remains firm and domestic price remains around 52 cents per unit in bulk, f.o.b. New York. For export, price is approximately 75 cents per unit in bags, f.o.b. New York. Triple superphosphate is sold up to the limit of productive capacity. There is considerable export interest and some few small lots have been sold at premium prices.

Potash

Schedule price prevails and the needs of the domestic consumers seem well supplied. Although there still exists a quite heavy export demand, practically no business has been done except to the United Kingdom.

Dried Blood

Domestic production advanced to $2.40 ($2.91½ per unit N), New York basis. Imported blood is held at $2.60 ($3.16 per unit N), c.i.f. Demand for this commodity is a little better.

Tankage

There is small interest in this market, with domestic material being quoted at $2.50 ($3.04 per unit N) and 10 cents, f.o.b. New York. South American material is offered at $2.90 ($3.52½ per unit N) and 10 cents.

Nitrogenous Material

Remains dull with no change in price over the past few weeks. Deliveries are being made regularly against seasonal contracts.

Bone Meal

South American 3 and 50 per cent grade can be bought for $30.50 per ton, c.i.f., and the 4½ and 50 per cent grade at $31.50, same basis. Domestic material is very scarce with practically no offerings.

Fish Scrap

Supplies are almost exhausted. The fishing season is now concluded on Chesapeake Bay and there are no reports as yet of any catch in the Carolinas. Menhaden meal shows a good advance and is now quoted nominally at $54.00 per ton, Baltimore.

Soya Bean Meal

Because of very slow receipt of beans, crushers are having difficulty in filling early sales commitments. As a result, the bean market is up to a point where it is necessary for the crushers to realize $30.60 per ton in bulk, delivered Boston area, equivalent to $30.20, delivered New York rate points. De-

FERTILIZER MATERIALS

LET US QUOTE YOU ON YOUR REQUIREMENTS OF THESE MATERIALS

✣

PHOSPHATE ROCK

✣

SUPERPHOSPHATE

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DOUBLE SUPERPHOSPHATE

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NITRATE *of* SODA

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SULPHURIC ACID

✣

SULPHATE *of* AMMONIA

✣

BONE MEALS

✣

POTASH SALTS

✣

DRIED BLOOD

✣

TANKAGES

✣

COTTONSEED MEAL

✣

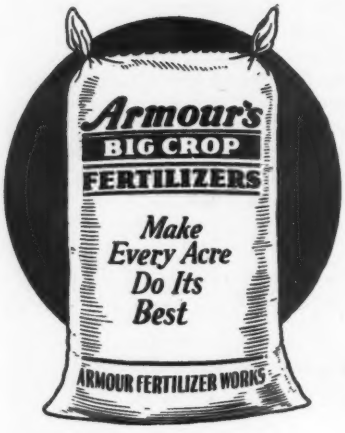
BONE BLACK

✣

PIGMENT BLACK

✣

SODIUM FLUOSILICATE



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mand for this commodity is reflected in market activity. In spite of the liberal supply of beans from this year's crop, soya bean meal is now expected to be in a tight position for the next sixty days.

ATLANTA

Cottonseed Meal Prices Remain Firm in Spite of Larger Cotton Crop. South American Organics in the Market.

Exclusive Correspondence to "The American Fertilizer."

ATLANTA, November 4, 1940.

Cottonseed meal remains firm throughout the cotton belt in spite of an increase in production amounting to about one million bales of cotton. The farmers and ginners seem to be awaiting the outcome of the November 5th election before making any seed commitments of consequence. Most of the mills here in the southeast, especially in the peanut belt are running full tilt in the crushing of peanuts and at the present time are manifesting little or no interest in cottonseed as the oil market is easy and they cannot make a profit out of meal, hulls and linters. Consequently we have a quiet market on cottonseed meal and prices are still above the parity of other protein concentrates. It would appear that prices will have to come down before the current crop is marketed, unless, of course, a large export demand should develop which does not seem to be likely.

There is a steady demand for sulphate of ammonia but in spite of production running some 125,000 tons above last year's production up to the present time, there is no surplus and supplies are difficult to secure.

Nitrate of soda, on the other hand, is in plentiful supply with large port stocks being accumulated by the producers in preparation for the coming season's demand.

Organic ammoniates have seen but little change since our last report, with the demand only nominal. As long as Europe is blockaded, there will be a steady flow of South American products into this market and these, coupled with our own domestic supply, would seem to indicate that no sustained upturn in price levels is in prospect, the scarcity of freight being the main controlling factor.

The markets are as follows:

Blood.—South American, $2.55 ($3.10 per unit N), c.i.f. the ports.

Tankage.—South American, $2.60 ($3.16 per unit N) and 10 cents, c.i.f.

Domestic Nitrogenous Tankage. — $1.65 ($2.00½ per unit N) western producing points.

Fish Meal.—Scarce, market nominally $46.00 for unground scrap.

Acidulated Scrap.—None available at present.

Sulphate of Ammonia.—No price change.

Nitrate of Soda.—Unchanged.

Cottonseed Meal.—Prime 8 per cent, $26.00 to $26.50, basis f.o.b. Memphis. Southeastern mill points, $1.50 per ton higher.

Steamed Bone Meal.—3 and 50 per cent, $31.50, ex-vessel.

Raw Bone Meal.—4½ and 45 per cent, $31.00, ex-vessel.

POTASH CO. OF AMERICA MAKES PLANT ADDITIONS

The Potash Company of America is spending about $300,000 on improvements and additions to its plant at Carlsbad, New Mexico. The principal additions will be to increase power at the plant for the production of potash derivatives which the company is going into on an enlarged scale.

Manufacturers' Sales Agents for **DOMESTIC**

Sulphate of Ammonia

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Valuable not only as a source of nitrogen, but also to help maintain the supply of other plant food elements *naturally* blended with it.

WE'S BACK ON YO' RADIO AGAIN!

Enjoy the Uncle Natchel program every Sunday afternoon, beginning November 24th, on WSB, WRVA, WSM, WIS, WOLS, WPTF, WBT, KWKH, WJDX, WMC, WWL, WAGF, WDBO, WSFA, WJRD, WJBY.

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BALTIMORE

Fall Tonnage of Mixed Goods Smaller Than Last Year. Little Demand for Materials Expected until Later in Season.

Exclusive Correspondence to "The American Fertilizer."

BALTIMORE, November 5, 1940.

The fall shipping season is now rapidly drawing to a close, and from all indications it would appear that the tonnage is somewhat less than last fall. Interest in further supplies of materials is practically at a standstill, as all manufacturers will be carrying over stocks to spring.

Ammoniates.—The market on feeding tankage continues fairly firm and unchanged, at $2.80 to $2.85 per unit of nitrogen for tankage. South American blood is ruling easier being in the neighborhood of $2.90 per unit of nitrogen, but very little buying interest is being manifested.

Nitrogenous Material.—This material is unchanged, and ranges from $2.55 to $2.65 per unit of nitrogen, f.o.b. Baltimore, with no interest being shown.

Sulphate of Ammonia.—This commodity continues scarce, and unless first hands release further quantities, it looks as though there will be a shortage next spring. The export demand continues and is close to $10.00 per ton higher than the schedule for domestic consumption, on which latter basis, however, there is no further tonnage available at present.

Nitrate of Soda.—The between-season lull is now on and the demand is light. Both domestic producers and importers quote $29.40 per ton of 2,000 lb., in 100-lb. bags, ex port warehouses, with differential of 70 cents per ton less in 200-lb. bags, and $27.00 per ton in bulk.

Fish Scrap.—The menhaden fishing season is also drawing to a close, and the market continues firm at around $3.75½ per unit of nitrogen, and 10 cents per unit of B.P.L., f.o.b. fish factories. While this is out of proportion with other feeding materials, and little business passing, it is reported that stocks are not overly heavy.

Superphosphate.—There is no change in the market which continues firm at $8.00 per ton of 2,000 lb., basis 16 per cent for run-of-pile, and $8.50 per ton of 2,000 lb., for flat 16 per cent grade, both in bulk, f.o.b. producers' works, Baltimore.

Bone Meal.—No change in the market is anticipated, with South American 3 and 50

HIGRADE MURIATE OF POTASH
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Also 50% K_2O Grade
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Approximately 30% K_2O
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A PRODUCT OF NEW MEXICO

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The United States Potash Company is geared to do its part in the emergency. Ten years ago this Company sank the first shaft of its mine near Carlsbad, New Mexico. Since then, it has worked consistently to free the United States from dependence upon foreign countries for its supply of potash. To meet today's greater need, our operations are keyed to maximum production. Throughout mine and plant, mining and refining equipment is keeping pace with the latest mechanical developments. A skilled and loyal personnel assures the highest peak of operating efficiency. Conscious of our increased responsibility, we pledge ourselves to the task of striving to assure the United States for all time of sufficient domestic supplies of potash.

UNITED STATES POTASH COMPANY, INC., 30 ROCKEFELLER PLAZA, NEW YORK, N. Y.

per cent steamed bone meal obtainable around $31.00 per ton, and 4½ and 47 per cent South American raw bone meal still obtainable at $31.00 to $32.00 per ton, c.i.f. Baltimore.

Potash.—The market continues firm and unchanged. There seems to be no uneasiness on the part of manufacturers regarding an acute shortage as they all figure with stocks on hand and domestic producers there will be enough to go around for normal requirements next spring.

Bags.—The burlap market is again higher, and the present price is around $116.00 per thousand, basis 40 cut 54 in. for plain, 10-oz. for spring delivery, delivered Baltimore.

TENNESSEE PHOSPHATE

Fall Mixed Fertilizer Shipments Completed but Ground Rock Shipments Continue. Fertilizer Value of Ground Rock to be Further Investigated.

Exclusive Correspondence to "The American Fertilizer."

COLUMBIA, TENN., November 4, 1940.

While fall fertilizer shipments in general are practically over the movement of ground phosphate rock for direct application continues at an unusually good rate for this late in the year, and October carried out the predictions of two weeks ago, by showing an increase of more than 30 per cent over October, 1939, and the 1940 shipments in that line are more than 15 per cent in excess of the 1939 shipments to same date.

The United States Department of Agriculture reports that arrangements have been made to bring up to date the Waggaman Bulletin 699 of 1917, which has been submerged for over twenty years and the false impression allowed to continue to grow that fertilization with this form of phosphoric acid for the farmer was uneconomical.

Application was made to the A.O.A.C. to so change their definition of "Available Phosphoric Acid" as to prevent their official definition being used to mislead farmers and many officials into the erroneous belief that the remainder of the phosphoric acid in rock phosphate and similar materials will not grow crops, or in the language of some of them, that "because it is not available, using it for fertilizer is like feeding ground leather to dairy cattle."

Of course, it is well known to those who have really investigated, that the whole program of the TVA and AAA, as far as phosphate is concerned, should have either been carried out with finely ground rock phosphate, or at least with a full comparison of that product with superphosphate in every demonstration and every grant of aid. In either case, the great TVA experiment would even have been worth the twenty or thirty million dollars it has cost U. S. taxpayers, instead of having a vast amount of money spent, ostensibly to show that superphosphate, in use with fine results for over fifty years, was a good thing, but in reality only resulting in falsely creating the impression that farmers were being made to pay too much for it by private sellers.

A properly developed system of permanent agriculture developed with ground phosphate rock would make hay, grain and livestock farming profitable at the lowest prices yet known for agricultural products, would increase use of rock phosphate tenfold, and still more than double the use of superphosphate and commercial fertilizer by developing more and more farmers into the class which could afford to put in the crops that benefit economically from its use.

The regular monthly meetings of the Middle Tennessee Technical Society have had very interesting discussions on the subjects of "desirability of restoring mined areas to cultivation" and "pollution of streams by washing phosphate rock." It was brought out that the

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See Page 4

total area of disturbed surface in Maury County is less than 1½ per cent of the total area of the country, while that of the total disturbed area in Tennessee, would be less than that, as by far the greatest part of mining has been in Maury County. It was also brought out that pollution of streams as far as injury to fish and game has been really insignificant, principal difficulty being with riparian owners, stockwater &c.

Officers elected at meeting on October 29th: H. R. Mosley of TVA, President; H. D. Ruhm, of Ruhm Phosphate Co., 1st Vice-President; Felix Williams of Monsanto Chemical Co., 2nd Vice-President; R. J. Grissom of Charleston Mining Co., Secretary-Treasurer.

FREE ACIDS IN SUPERPHOSPHATE AND THEIR DETERMINATION

(Continued from page 10)

methyl red has this tendency only in very slight degree. There is a vast difference between the results obtained by the two indicators, although it has been commonly believed that they are interchangeable in making the titration.

The difference between the first and second titrations in the experiments were found as follows:

HF—Methyl Orange Aqueous Solution showed equal volume 0.1 *N* NaOH for first and second titrations, same as H_3PO_4.

H_2SiF_6—Methyl Orange, almost same as H_3PO_4—19.9 cc. 0.1 *N* and 19.1 cc.

HF—Methyl Red, Aqueous Solution, first titration 10 cc., second titration 0.25 cc.

H_2SiF_6—Methyl Red, Aqueous Solution, first titration 36.5 cc., second titration 2.7 cc.

H_2SiF_6—Methyl Red, Water-Acetone Solution, containing 50 cc. of acetone, first titration 26.8 cc., second titration 3.0 cc.

An experiment was also made on a sample of the hydrofluosilicic acid condenser water from superphosphate manufacture with similar results.

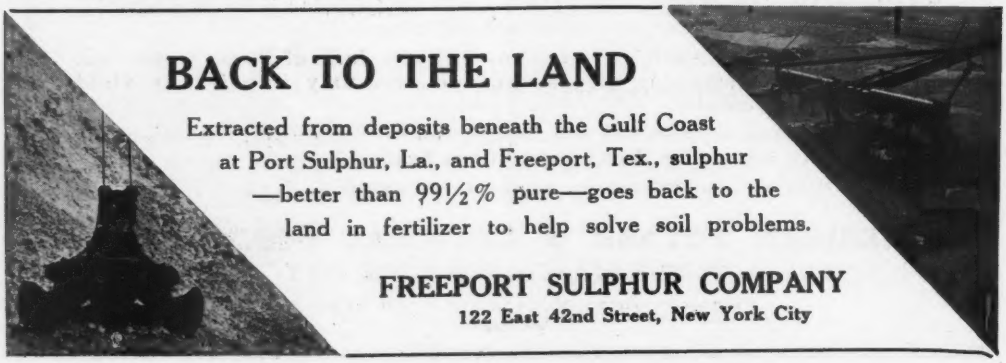
It will be seen therefore that methyl red only shows about 2.5% of the titration that is shown by methyl orange in the case of HF and only about 8% in the case of H_2SiF_6.

It may be of interest here to note that according to Hill[2] and coworkers, hydrofluoric acid appears to be the main fluorine acid present in superphosphate. In this connection the acid in dilute solution tends to ionize to a weak monobasic acid, but in more concentrated solutions there is some evidence to show that it ionizes somewhat as a dibasic acid pointing to the formula H_2F_2.[3] As a monobasic acid it could not show a titration of a second hydrogen atom.

It would appear in the light of these experiments that the double titration method could be made to show about as accurately as any other method the small amount of fluorine acids equivalent to H_3PO_4 in the extract by very carefully standardizing the double titration against solutions known to contain only H_3PO_4 in the same medium, but this would necessarily have to be done with great care. Since free sulphuric acid is ordinarily present only in traces, it may be neglected. When ether is used as the extractant, a much greater amount of the fluorine acids are recovered, amounting in the case of day-old superphosphate to as much as 0.30% expressed as F.[4]

Some idea of the effect of hydrofluoric acid has been gained by treating ground phosphate rock with this acid and comparing the results after treating the rock with approximately an equivalent amount of sulphuric acid. Purposely these were greatly under-acidulated products

[2] Journal of the A.O.A.C., May, 1936.
[3] Private Communication from Dr. J. W. Watson, Virginia Polytechnic Institute.
[4] Private Communication from Dr. K. D. Jacob.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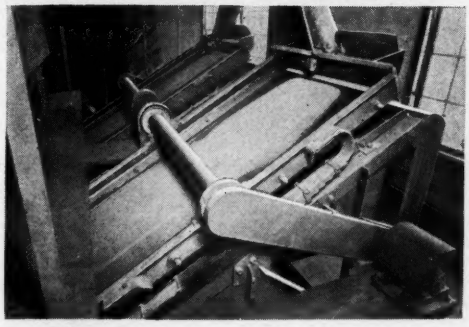

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having a ratio of one part sulphuric acid equivalent to 50° Bé. acid to six parts of ground phosphate rock, enough water being added in order to obtain an intimate mixture. The amount of rock taken was 250 grams and the mixtures were allowed to stand three days before making the analyses which showed practically the same available P_2O_5 on the same moisture basis of 17.22% as follows:

	Phosphoric Acid			
	Avail. %	Insol. (Citrate) %	Total %	Free %
Using hydrofluoric acid	5.20	22.40	27.64	None
Using sulphuric acid...	5.21	19.16	24.37	None

An experiment was also made by mixing one part of hydrofluosilicic acid containing 28% H_2SiF_6 with two parts of ground phosphate rock, which is equivalent to approximately one part of 50° Bé. sulphuric acid and six parts of rock, placing the mixture over a water bath and drying to good mechanical condition. After aging for two days the following results were found:

Moisture	6.80%
Available phosphoric acid (P_2O_5)	16.59%
Citrate-insoluble phos. acid (P_2O_5)	9.96%
Total phosphoric acid (P_2O_5)	26.55%
Total free acids equiv. to H_3PO_4	1.84%

It has been felt by some that monocalcium phosphate has a reaction on ground phosphate rock, and an experiment was made to determine this point as follows:

A mixture consisting of 75 grams of pulverized monocalcium phosphate (Baker's Analyzed), 25 grams of ground phosphate rock and 20 cc. of water was made up and dried on a steam bath for 45 minutes. A similar mixture was made up except that sand was used in place of monocalcium phosphate, and dried in a similar manner. The results were as follows:

	Phosphoric Acid				
	Citrate-Insoluble %	Avail. %	Total %	Free %	Moisture %
With monocalcium phosphate	6.32	43.10	49.42	1.15	3.44[5]
Without monocalcium phosphate	6.24	2.38	8.62	0.00	0.12

[5] Moisture determined at 100° C. The salt begins to lose some water of crystallization at about 80° C.

While the experiment is not exactly a parallel case, the amount of free H_3PO_4 formed from the monocalcium phosphate under the conditions in which the experiment was made should about compensate for the increased amount of work necessary for the ammonium citrate to act upon the corresponding amount of dicalcium phosphate produced, and since the citrate-insoluble phosphoric acid is in very close agreement in both cases, it may be assumed that monocalcium phosphate has no appreciable action in converting citrate-insoluble phosphoric acid into available phosphoric acid.

On account of the fact that the amount of free acid present in superphosphate is generally dependent upon the extent of acidulation, it is sometimes desired to reconstruct the mixing formula that has been used. This is done by determining the amounts of total P_2O_5 and sulphur in the superphosphate and phosphate rock used and applying the following formula:

$$\frac{\%\text{ of total } P_2O_5 \text{ in superphos. X } 2{,}000}{\%\text{ of total } P_2O_5 \text{ in rock}} = \text{equals pounds rock in a shrunk ton.}$$

Lb. of rock divided by twenty equals % rock.

$$\frac{\%\ SO_3 \text{ in superphos.} - SO_3 \text{ in \% rock X } 2{,}000}{50.81\%\ SO_3 \text{ in } 50°\text{ Bé. acid}} = \text{equals lb. of } 50°\text{ acid at } 60°\text{ F.}$$

Therefore the proportion would be:

Lb. rock : lb. of 50° acid : : 1,000 : X

X = lb. of 50° acid used on the basis of 1,000 lb. of rock. The amount of acid of any other strength may also be calculated.

The reconstruction of the mixing formula is of considerable value in chemical control practice when there is doubt as to the actual formula that is being executed. At times there

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is great doubt as to the accurate measuring or weighing of the acid, strength of the acid or weighing of the dust. By careful analytical work, a mixing formula may be checked within ten pounds of the truth.

Summary

A rapid method for determining the free acids is given and some advantages of the method are set forth, also a way in which the volatile fluorine acids in the acetone extract equivalent to H_3PO_4 may be determined and the practical value of the free acid determination is mentioned. Practical experiments have been made showing the changes which take place in superphosphate and a comparison in the lowering of the free acids and increase in available phosphoric acid is made with theory. Factors affecting results, especially on freshly made superphosphate, are given. Methyl orange shows the titration of two hydrogen atoms in the case of HF and H_2SiF_6 while methyl red has only a slight tendency to show titration of a second hydrogen. HF and H_2SiF_6 show pronounced action on ground phosphate rock but monocalcium phosphate apparently has no appreciable action.

An equation is given from which a mixing formula may be accurately calculated from analytical data.

Acknowledgment with appreciation for helpful suggestions and literature furnished is hereby made to Dr. K. D. Jacob, Dr. W. L. Hill, Dr. W. H. Ross, Dr. J. Wilbur Watson, Mr. C. A. Butt, Mr. Charles E. Heinrichs and Mr. Geo. F. Moore, also to the superintendents of the various factories who have so kindly cooperated in furnishing samples of superphosphate at various intervals.

References: Journal A.O.A.C. May, 1934, Ross and Beeson; Journal A.O.A.C. Aug., 1934, Hill and Jacob; Journal A.O.A.C. May, 1935, Hill, Beeson, Ross and Mertz; Journal A.O.A.C. May, 1936, Hill and Beeson.

ALSATIAN POTASH AGAIN UNDER GERMAN CONTROL

With the reincorporation of Alsace into the German Reich, the potash deposits in that region again come under the control of the German Potash Syndicate. At the close of World War I in 1919, the French Government formed a central sales organization for the distribution of Alsatian potash and in 1924 helped form the N. V. Potash Export My. to handle export sales of both German and French potash. This organization was dissolved at the outbreak of World War II. It cannot be foreseen how far the German Potash Syndicate will be able to take advantage of the change in conditions, since the current blockade makes export shipments ouside of continental Europe impossible and other countries are making great efforts to develop potash deposits.

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The production of by-product sulphate of ammonia during September, according to the U. S. Bureau of Mines, continued at the high levels established during the previous months. The September output was 62,483 tons, about even with August production of 62,254 tons, but 18 per cent ahead of September, 1939, production of 52,992 tons. During the first nine months of the year, total production increased 31 per cent, the respective figures being 526,162 tons in 1940, and 400,280 tons in 1939.

Figures for by-product ammonia liquor (NH_3 content) were: 2,412 tons in September, 1940; 2,347 tons in August, 1940; 1,976 tons in September, 1939; 20,602 tons during January-September, 1940; 16,855 tons during January-September, 1939.

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Fairlie, Andrew M., Atlanta, Ga.

CONDITIONERS AND FILLERS
American Limestone Co., Knoxville, Tenn.

CONTACT ACID PLANTS
Chemical Construction Corp., New York City.

COPPER SULPHATE
Tennessee Corporation, Atlanta, Ga.

COTTONSEED PRODUCTS
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

CRANES AND DERRICKS
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
Link-Belt Speeder Corp., Chicago, Ill. and Cedar Rapids, Iowa.
Sackett & Sons Co., The A. J., Baltimore, Md.

CYANAMID
American Agricultural Chemical Co., New York City.
American Cyanamid Co., New York City.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Jett, Joseph C., Norfolk, Va.
Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

DENS—Superphosphate
Chemical Construction Corp., New York City.
Stedman's Foundry and Mach. Works, Aurora, Ind.

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DRYERS—Direct Heat
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons Co., The A. J., Baltimore, Md.

DRIVES—Electric
Link-Belt Company, Philadelphia, Chicago.

DUMP CARS
Link-Belt Company, Philadelphia, Chicago.
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Stedman's Foundry and Mach. Works, Aurora, Ind.

DUST COLLECTING SYSTEMS
Sackett & Sons Co., The A. J., Baltimore, Md.

ELECTRIC MOTORS AND APPLIANCES
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ELEVATORS
Atlanta Utility Works, East Point, Ga.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
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ELEVATORS AND CONVEYORS—Portable
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

ENGINEERS—Chemical and Industrial
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

ENGINES—Steam
Atlanta Utility Works, East Point, Ga.
Sackett & Sons Co., The A. J., Baltimore, Md.

EXCAVATORS AND DREDGES—Drag Line and Cableway
Hayward Company, The, New York City.
Link-Belt Company, Philadelphia, Chicago.
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FERTILIZER MANUFACTURERS
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American Cyanamid Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Farmers Fertilizer Co., Columbus, Ohio.
International Agricultural Corp., New York City.
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Taylor, Henry L., Wilmington, N. C.
Wellmann, William E., Baltimore, Md.

FOUNDERS AND MACHINISTS
Atlanta Utility Works, East Point, Ga.
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
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Stedman's Foundry and Mach. Works, Aurora, Ind.

GARBAGE TANKAGE
Wellmann, William E., Baltimore, Md.

GEARS—Machine Moulded and Cut
Jeffrey Manufacturing Co., The, Columbus, Ohio.
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GEARS—Silent
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

GELATINE AND GLUE
American Agricultural Chemical Co., New York City.

GUANO
Baker & Bro., H. J., New York City.

HOISTS—Electric, Floor and Cage Operated, Portable
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.

HOPPERS
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Link-Belt Company, Philadelphia, Chicago.
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IMPORTERS, EXPORTERS
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
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IRON SULPHATE
Tennessee Corporation, Atlanta, Ga.

INSECTICIDES
American Agricultural Chemical Co., New York City.

LACING—Belt
Sackett & Sons Co., The A. J., Baltimore, Md.

LIMESTONE
American Agricultural Chemical Co., New York City.
American Limestone Co., Knoxville, Tenn.
Ashcraft-Wilkinson Co., Atlanta, Ga.
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Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
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MACHINERY—Acid Making
Atlanta Utility Works, East Point, Ga.
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Chemical Construction Corp., New York City.
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Monarch Mfg. Works, Inc., Philadelphia, Pa.
Sackett & Sons Co., The A. J., Baltimore, Md.
Stedman's Foundry and Mach. Works, Aurora, Ind.

MACHINERY—Coal and Ash Handling
Hayward Company, The, New York City.
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.

MACHINERY—Elevating and Conveying
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MACHINERY—Tankage and Fish Scrap
Atlanta Utility Works, East Point, Ga.
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MAGNESIA
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MANGANESE SULPHATE
Tennessee Corportion, Atlanta, Ga.

MIXERS
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Stedman's Foundry and Mach. Works, Aurora, Ind.

NITRATE OF SODA
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Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
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Wellmann, William E., Baltimore, Md.

NITRATE OVENS AND APPARATUS
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American Agricultural Chemical Co., New York City.
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International Agricultural Corp., New York City.
Smith-Rowland Co., Norfolk, Va.
Wellmann, William E., Baltimore, Md.

NOZZLES—Spray
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PACKING—For Acid Towers
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Chemical Construction Corp., New York City.

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Bradley & Baker, New York City.
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Huber & Company, New York City.
International Agricultural Corp., New York City.
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Ruhm, H. D., Mount Pleasant, Tenn.
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Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

PIPES—Chemical Stoneware
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PIPES—Wooden
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Fairlie, Andrew M., Atlanta, Ga.
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POTASH SALTS—Dealers and Brokers
American Agricultural Chemical Co., New York City.
Armour Fertilizer Works, Atlanta, Ga.
Ashcraft-Wilkinson Co., Atlanta, Ga.
Baker & Bro., H. J., New York City.
Bradley & Baker, New York City.
Huber & Company, New York City.
International Agricultural Corp., New York City.
Jett, Joseph C., Norfolk, Va.
Schmaltz, Jos. H., Chicago, Ill.
Synthetic Nitrogen Products Co., New York City.
Taylor, Henry L., Wilmington, Del.
Wellmann, William E., Baltimore, Md.

POTASH SALTS—Manufacturers and Importers
American Potash and Chem. Corp., New York City.
Potash Co. of America, Baltimore, Md.
United States Potash Co., New York City.

PULLEYS AND HANGERS
Atlanta Utility Works, East Point, Ga.
Link-Belt Company, Philadelphia, Chicago.
Sackett & Sons Co., The A. J., Baltimore, Md.
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PUMPS—Acid-Resisting
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.
Monarch Mfg. Works, Inc., Philadelphia, Pa.

PYRITES—Brokers
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Baker & Bro., H. J., New York City.
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SEPARATORS—Air
Sackett & Sons Co., The A. J., Baltimore, Md.

SEPARATORS—Including Vibrating
Link-Belt Company, Philadelphia, Chicago.
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Sackett & Sons Co., The A. J., Baltimore, Md.
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SHOVELS—Power
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Sackett & Sons Co., The A. J., Baltimore, Md.

SPRAYS—Acid Chambers
Monarch Mfg. Works, Inc., Philadelphia, Pa.

SPROCKET WHEELS (See Chains and Sprockets)

STACKS
Sackett & Sons Co., The A. J., Baltimore, Md.

SULPHATE OF AMMONIA
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Wellmann, William E., Baltimore, Md.

SUPERPHOSPHATE—Concentrated
Armour Fertilizer Works, Atlanta, Ga.
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U. S. Phosphoric Products Division, Tennessee Corp., Tampa, Fla.

SYPHONS—For Acid
Monarch Mfg. Works, Inc., Philadelphia, Pa.

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TANKAGE
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Smith-Rowland Co., Norfolk, Va.
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Wellmann, William E., Baltimore, Md.

TANKAGE—Garbage
Huber & Company, New York City.

TANKS
Jeffrey Manufacturing Co., The, Columbus, Ohio.
Sackett & Sons Co., The A. J., Baltimore, Md.

TILE—Acid-Proof
Charlotte Chem. Laboratories, Inc., Charlotte, N. C.

TOWERS—Acid and Absorption
Chemical Construction Corp., New York City.
Fairlie, Andrew M., Atlanta, Ga.

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Jeffrey Manufacturing Co., The, Columbus, Ohio.
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UREA
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UREA-AMMONIA LIQUOR
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VALVES—Acid-Resisting
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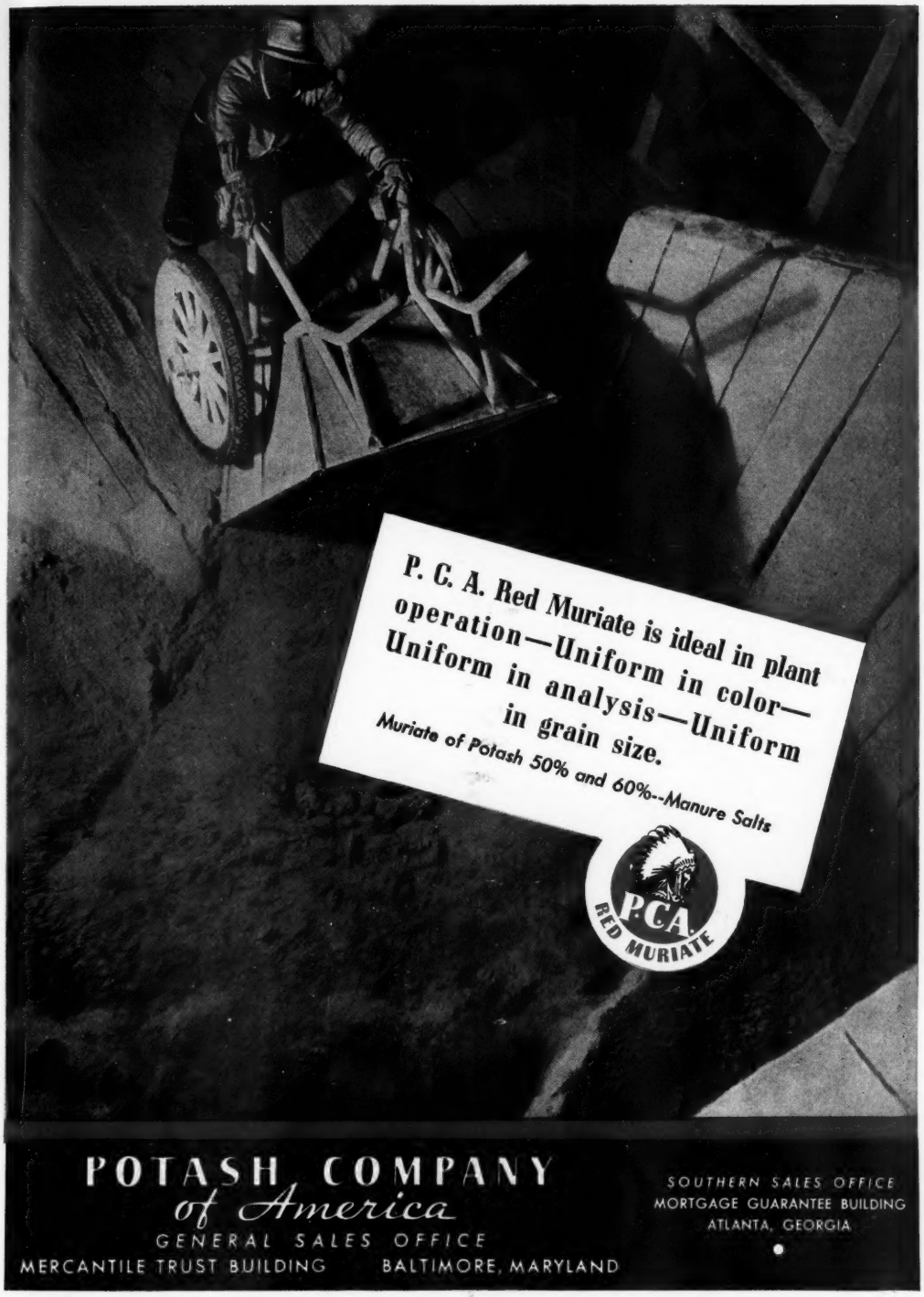
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